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CASE REPORT

Case Report

Spinal Anesthesia by Mini-laminotomy for a Patient with Ankylosing Spondylitis who was Difficult to Anesthetize

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Abstract

Background Orthopaedic surgeons frequently encounter patients with ankylosing spondylitis who would benefit from various types of lower limb operations; however, some of these patients present challenges for anesthesiologists.

Case Description We report the case of a 65-year-old patient with a fractured femoral component 30 years after a cemented THA. The patient had severe tracheal stenosis and ankylosing spondylitis making general endotracheal and conventional neuraxial anesthesia nearly impossible.

Literature Review Possible alternative anesthetic approaches described in the literature include awake fiberoptic bronchoscopic guided intubation, laryngeal mask airway, and caudal anesthesia.

Purposes and Clinical Relevance We achieved successful anesthesia using spinal laminotomy with the patient under local anesthesia followed by insertion of a spinal catheter and injection of an anesthetic agent. The loosened component was revised to a cementless THA.

Each author certifies that he has no commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.
Each author certifies that his institution approved the reporting of this case and that all investigations were conducted in conformity with ethical principles of research.

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Introduction

Patients with ankylosing spondylitis needing revision THA owing to implant loosening or infection are seen frequently. Preparation of these patients for surgery is challenging because they often have substantial airway restrictions and rigid spines. Comorbidities including restrictive pulmonary disease add to the risk of anesthesia. In addition to conventional, standard general or neuraxial anesthesia techniques, there are numerous alternative anesthetic approaches described in the literature. These include awake videolaryngoscopic guided intubation [4], laryngeal mask airway [5], caudal anesthesia, and a lateral approach in placement of the spinal anesthesia needle [2, 3].

We describe an alternate method to prepare these patients for lower limb surgery.

Case Report

A 65-year-old man with a history of bilateral THAs for ankylosing spondylitis presented with right hip pain of a duration of 1 month. Bilateral hip arthroplasties (Trapezoidal-28 design, Zimmer, Warsaw, IN) had been performed 30 years earlier. The patient was pain-free and walking independently before onset of symptoms. There was no history of injury. The hip pain started insidiously and progressed with time. It was mechanical and radiated to the anterior aspect of the right thigh. He required regular analgesics for pain relief. Despite the pain, the patient could tolerate level-ground walking using one cane for 10 minutes. A radiograph showed fracture of the cemented femoral stem (Fig. 1). A revision of the THA was planned.

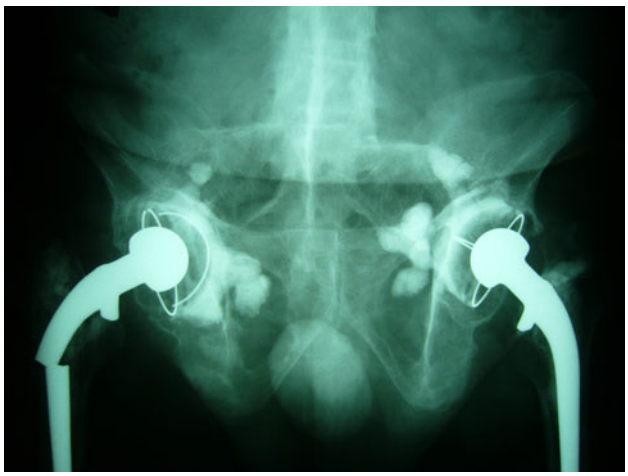

Fig. 1 A radiograph shows bilateral cemented THAs complicated with a right femoral stem fracture.

His medical history was significant for ankylosing spondylitis and posttuberculosis tracheal stenosis. The long-standing ankylosing spondylitis led to spontaneous fusion of the spine from the cervical to the lumbar regions (Fig. 2). The ligamentum flavum also was ossified (Fig. 3). He had shortness of breath and wheezing on exertion for many years. CT showed stenosis of the distal trachea at the level of the aortic arch. The transverse tracheal diameter was only 3.4 mm and the length of the stenotic segment was 1.6 cm. There was another narrowing at the right main bronchus origin. The intraluminal diameter was only 2.6 mm and the stenotic segment measured 1.4 cm in length. Complete collapse of the right upper lobe with calcified granulomata also was seen, in keeping with posttuberculosis changes. As a result of the tracheal stenosis, lung function tests showed a severe obstructive pattern with a forced expiratory volume in 1 second to forced vital capacity (FEV1:FVC) ratio of only 44%. The FVC and FEV1 were 68% and 40% of predicted values, respectively. Previous attempts at bronchoscopic tracheal dilatation and stenting had failed because of a rigid cervical spine and failure to insert a rigid bronchoscope by cardiothoracic surgeons.

Anesthetic assessment revealed a Mallampati Class IV airway [7], very limited neck movement, and marginal mouth opening of only 2 cm. Owing to the difficult airway access, tracheal stenosis with the impossibility of intubation with even a small endotracheal tube, and poor lung function, we considered general anesthesia to be contraindicated. Conventional neuraxial anesthesia also was not possible because of the ossified ligamentum flavum and lack of interlaminar space for entry. After discussion with various teams including our consultant spine surgeon, we decided the best option was a minilaminotomy and insertion of an intrathecal catheter for neuraxial anesthesia.

The patient was informed of his situation and our recommendation: attempting conventional neuraxial anesthesia first and if that failed to proceed to minilaminotomy. The patient declined an initial attempt at neuraxial anesthesia owing to his concerns about a high chance of failure

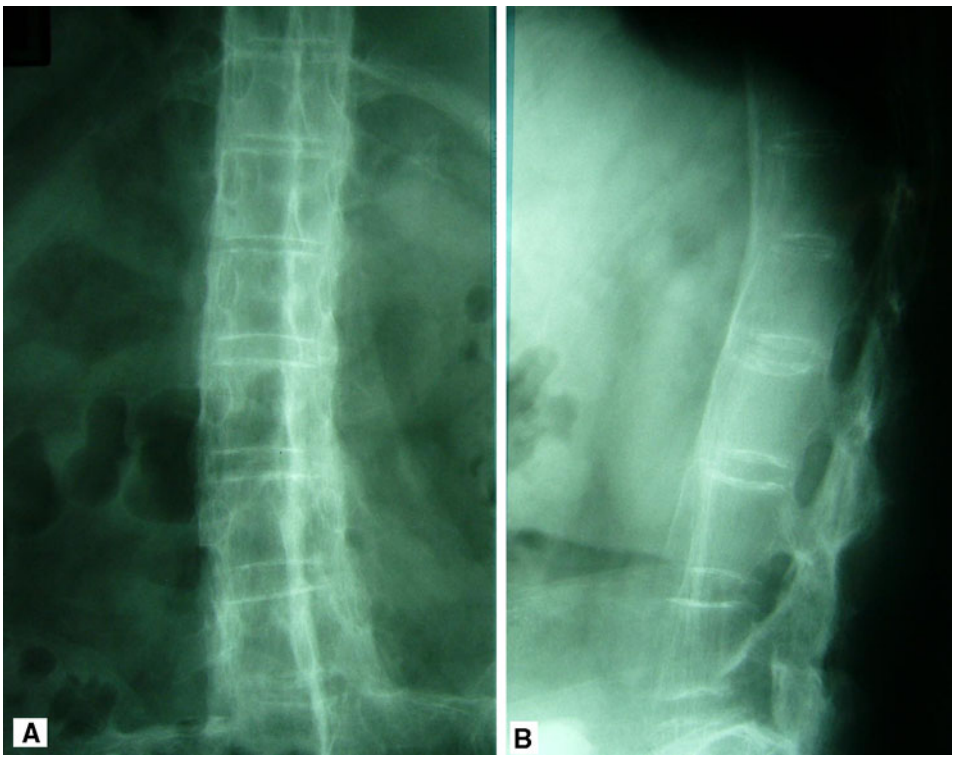

Fig. 2A–B (**A**) AP and (**B**) lateral radiographs show an ankylosed lumbar spine.

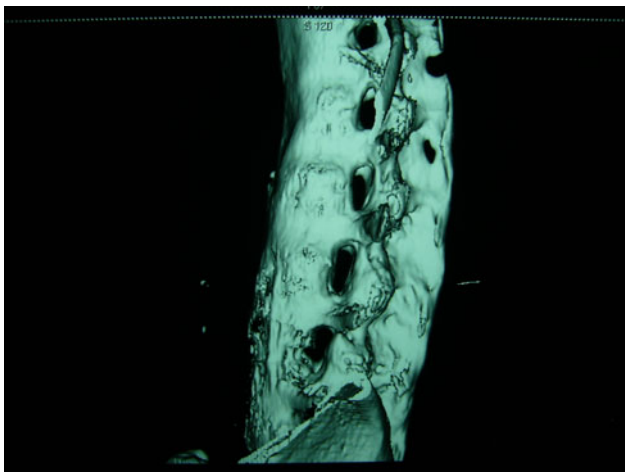

Fig. 3 A 3-D reconstruction CT scan shows a completely ossified ligamentum flavum.

and complications such as breakage of spinal needles. He elected to proceed directly to the minilaminotomy.

On arrival in the operating room, routine monitoring was applied and equipment for difficult intubation was checked and on standby. Two intravenous lines and one arterial line were secured under local anesthesia. The patient was placed in the left lateral decubitus position. He was sedated using a loading dose of dexmedetomidine (1 μg/kg body weight over 10 minutes) followed by continuous infusion. A 11.5-mL dose of 2% lignocaine with 1:200,000 adrenaline was infiltrated locally. Then a posterior longitudinal incision was made at the L3/L4 level, which was judged by palpation. Subperiosteal stripping of the paraspinal muscle was performed on the right side to expose the lamina. A 5-mm hole was made in it using a high-speed burr. The underlying ligamentum flavum was completely ossified. After exposing the dura, an 18-gauge Tuohy needle was introduced in the subarachnoid space through the exposed dura. Free flow of cerebrospinal fluid was observed and an 18-gauge spinal catheter was inserted and secured. The tip of the catheter was at the L2 level. Two milliliters 0.5% plain bupivacaine and 25 μg fentanyl were injected through the catheter. Complete sensory block was achieved up to the T10 level bilaterally, which was adequate for the subsequent part of the surgery.

We used a posterior approach to the hip with an extended trochanteric osteotomy. The loosened femoral component was revised successfully to a cementless porous-coated bow stem (Solution®; DePuy, Warsaw, IN). The acetabular component also was revised to a cementless cup (Duraloc®; DePuy, Leeds, UK). Vital signs including pulse rate, blood pressure, and oxygen saturation were stable throughout the surgery, which lasted for 3 hours. At the end of the operation, the spinal catheter was removed after injecting an additional 1 mL 0.5% plain bupivacaine

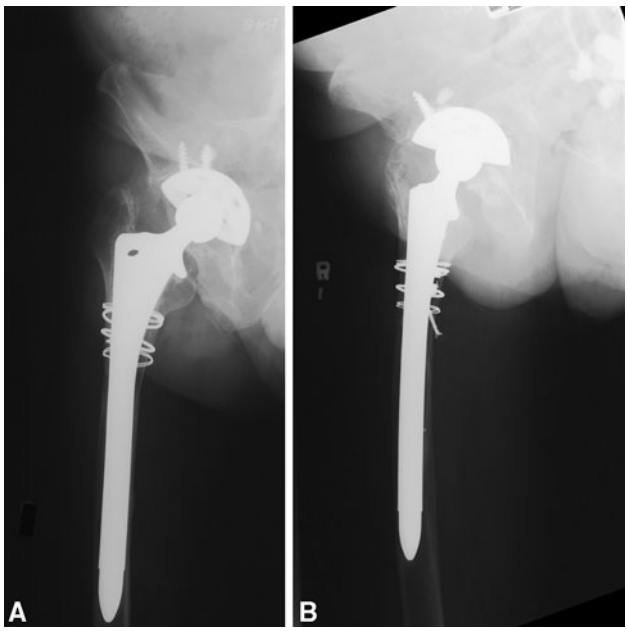

Fig. 4A–B (**A**) AP and (**B**) lateral radiographs show the result of cementless THA 3 years after revision.

to prolong the block and provide adequate postoperative analgesia. We did not seal the hole in the dura. The patient did not complain of headache and there was no sign of cerebrospinal fluid leakage during the postoperative period. The patient was given an intravenous self-controlled analgesic device with morphine for pain control after the sensory block wore off. Power and sensation of his lower limbs were completely normal 4 hours after the operation.

The patient made an uneventful recovery. He was allowed to bear weight as tolerated and was discharged home 3 weeks after the operation. At last followup at 3 years, the patient was pain-free and walked with one cane. Radiographs showed well-fixed implants (Fig. 4).

Discussion

Patients with ankylosing spondylitis can present tremendous challenges to the anesthesiologists owing to fusion of the cervical spine in flexion and stiffness of the temporomandibular joint [1]. These pathologic changes make airway management extremely difficult. Various methods of establishing an airway have been described to overcome these problems, including using awake fiberoptic bronchoscopic intubation or a laryngeal mask airway [6]. However, our patient had a known history of tracheal stenosis that, in combination with the above difficulties, was deemed contraindicated for general anesthesia.

Neuraxial anesthesia can be used as an alternative to general anesthesia in patients with ankylosing spondylitis

undergoing perineal or lower limb surgery, but formation of bony bridges (syndesmophytes) between adjacent vertebrae and ossification of the interspinous ligament and ligamentum flavum can make placement of epidural or spinal needles nearly impossible. Accordingly, different methods of achieving neuraxial anesthesia have been suggested, including epidural anesthesia through the caudal canal or using the lateral approach in placement of a spinal anesthesia needle [2, 3]. Each of these techniques has its own shortcomings. Caudal anesthesia can be complicated by intraosseous puncture and injection that results in systemic toxic reactions [10]. Spinal anesthesia by the lateral approach also has a considerable failure rate [8].

We describe an alternative technique for anesthetizing a patient with ankylosing spondylitis for lower limb surgery. Spinal osteotomy under local anesthesia is actually not a new technique. In 1958 Urist used this procedure for a patient with ankylosing spondylitis for correction of severe flexion deformity of the cervical spine [9]. Since then, these corrective osteotomies have been performed for more than half a century and many neurosurgeons and spine surgeons now are proficient with this procedure. The extent of surgical exposure and magnitude of bone resection were much smaller in our patient when compared with these classic corrective osteotomies. Thus our technique should be feasible at most centers.

Laminotomy under local anesthesia to expose the vertebral canal followed by insertion of a spinal catheter and injection of anesthetic agent can successfully prepare a patient for lower limb surgery. Possible complications include inadvertent injury of neural tissues during laminotomy, fracture of the spine owing to the creation of a stress riser, and the risk of a high spinal anesthetic block with hemodynamic collapse and respiratory impairment. This technique should be considered for patients in whom general anesthesia is contraindicated and neuraxial anesthesia is extremely difficult, such as patients with ankylosing spondylitis.

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References

1. Bourlier RA, Birnbach DJ. Anesthetic management of the parturient with ankylosing spondylitis. *Int J Obstet Anesth.* 1995;4:244–247.
2. DeBoard JW, Ghia JN, Guilford WB. Caudal anesthesia in a patient with ankylosing spondylitis for hip surgery. *Anesthesiology*. 1981;54:164–166.
3. Kumar CM, Mehta M. Ankylosing spondylitis: lateral approach to spinal anaesthesia for lower limb surgery. *Can J Anaesth.* 1995;42:73–76.
4. Lai HY, Chen IH, Chen A, Hwang FY, Lee Y. The use of the GlideScope for tracheal intubation in patients with ankylosing spondylitis. *Br J Anaesth*. 2006;97:419–422.
5. Lu PP, Brimacombe J, Ho AC, Shyr MH, Liu HP. The intubating laryngeal mask airway in severe ankylosing spondylitis. *Can J Anaesth.* 2001;48:1015–1019.
6. Maier WR, Cunningham PS. A new approach to securing a difficult airway. *J Clin Anesth.* 2005;17:286–289.
7. Mallampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D, Liu PL. A clinical sign to predict difficult tracheal intubation: a prospective study. *Can Anaesth Soc J.* 1985;32:429–434.
8. Schelew BL, Vaghadia H. Ankylosing spondylitis and neuraxial anaesthesia: a 10-year review. *Can J Anaesth.* 1996;43:65–68.
9. Urist MR. Osteotomy of the cervical spine: report of a case of ankylosing rheumatoid spondylitis. *J Bone Joint Surg Am.* 1958;40:833–843.
10. Weber S. Caudal anesthesia complicated by intraosseous injection in a patient with ankylosing spondylitis. *Anesthesiology.* 1985;63:716–717.